



Fire and Oxygen Deficiency Detection Systems Risk Analysis

S. Grau

GS-ASE-Alarm Systems

R2E Workshop, Tuesday 08.06.2010

Session 2: Equipment inventory, failure consequences and relocation constraints



Outline

- Equipment Inventory in *R2E Critical Areas*
- Relocation Constraints in *R2E Critical Areas*
- Failure Consequences
 - CNGS test results
- Costs & Planning
- Additional comment on the PS



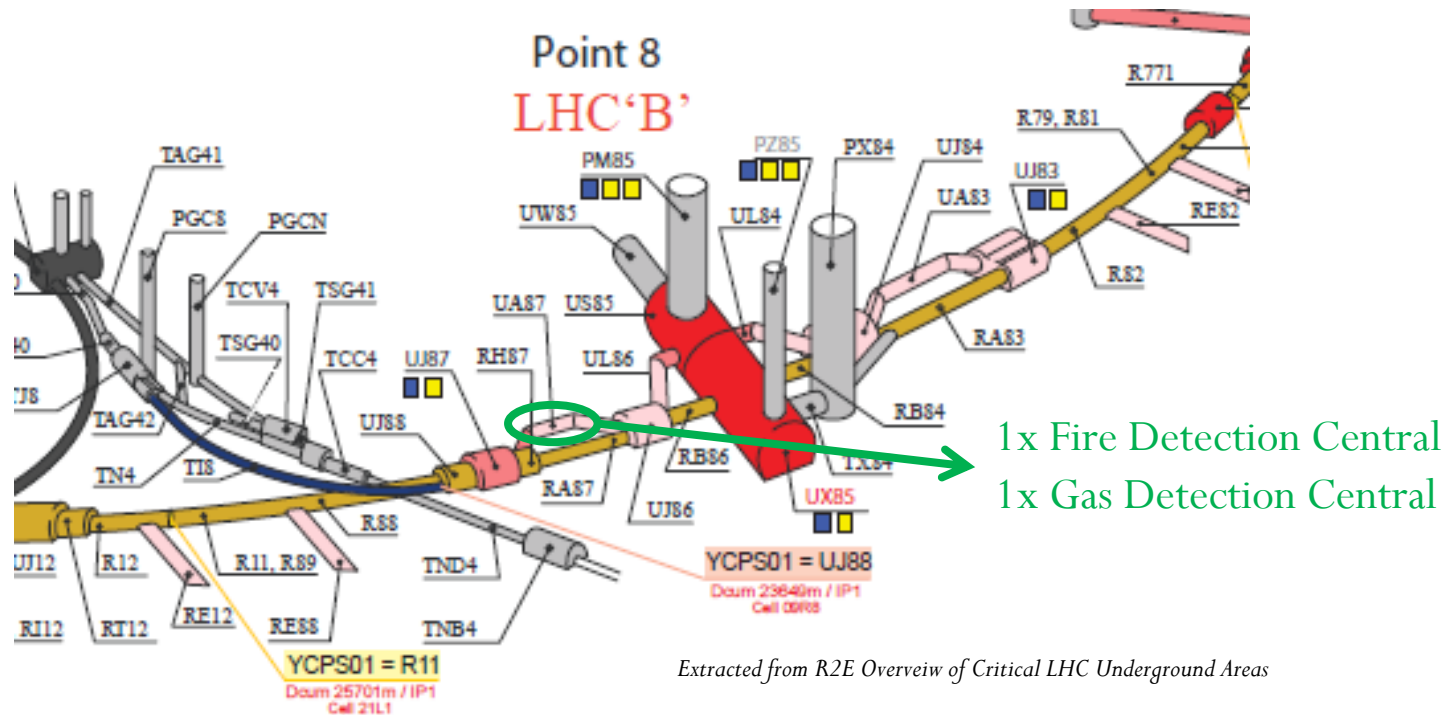
Equipment Inventory

Point 8 – Critical R2E areas

Detection Equipment	Location	Criticality
Fire Detection Central	UA87	SAFE (relocation done)
Fire Detectors	UW85	SAFE (relocation done)
	UL84- UA83-UJ83	SAFE
	RE82, RE88	SAFE
	UL86 (detection in US) -UA87-UJ87	SAFE
ODH Detection Central	UA87	SAFE (relocation done)
ODH Detectors	R82-RE82-R81	SAFE
	R88-RE88-R89	SAFE
	UX85	SAFE
	UJ84-UA83-UJ83	SAFE
	UJ86-UA87-UJ88	SAFE
	TI8	SAFE

Equipment Inventory

Point 8 - Critical R2E areas



- No equipment in critical areas => No relocation required



Equipment Inventory

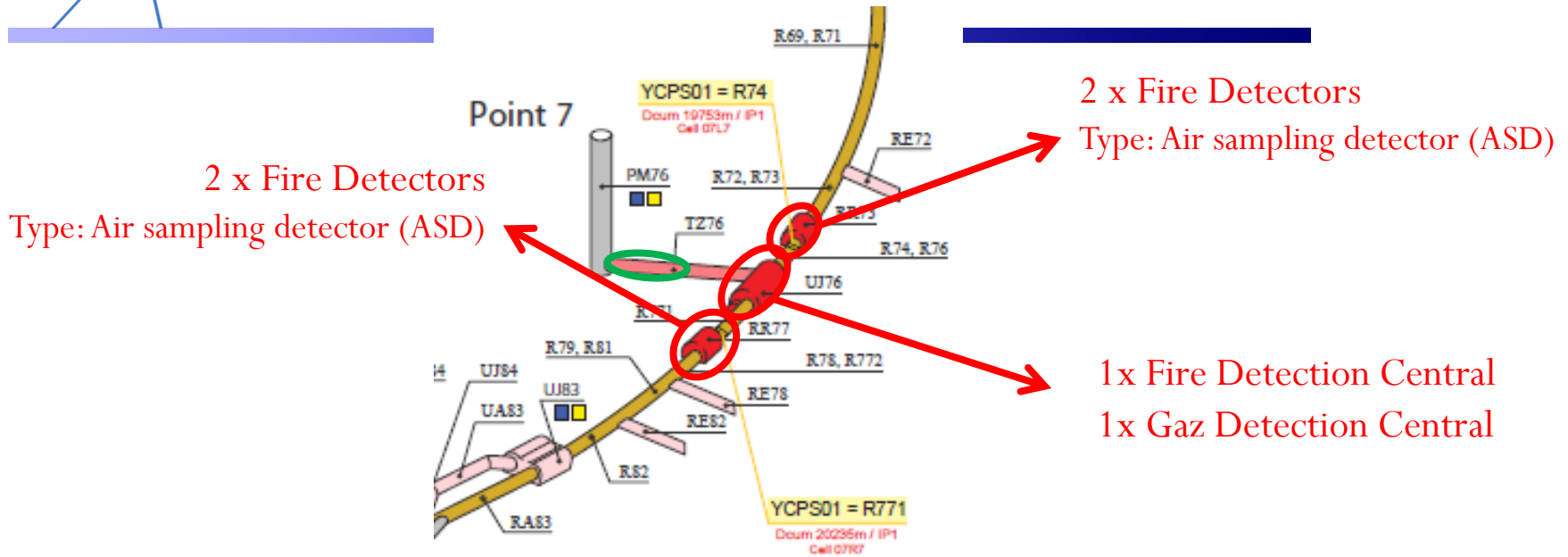
Point 7- Critical R2E areas

Detection Equipment	Location	Criticality
Fire Detection Central Fire Detectors	UJ76 (Safe room) RE72, RE78, UJ76, TZ76, US76, RR73, RR77	Relocation to TZ76 SAFE SAFE SAFE SAFE Relocation
ODH Detection Central ODH Detectors	UJ76 (Safe room) R71-RE72-R72 R79-RE78-R78 UJ76 TZ76 RR77, RR73	Relocation to TZ76 SAFE SAFE SAFE SAFE SAFE



Relocation Constraints

Point 7 - Critical R2E areas



Extracted from R2E Overview of Critical LHC Underground Areas

- Central: Space allocated for fire detection central and detectors. Hardware Reset to be cabled to an accessible area (surface ?). Under verification space available for gas detection central.
- RR Detectors: Non standard air sampling detection over 400 m
=> Prototyping: Performance test satisfactory (3 min over 400 m).
Final design being prototyped. Location for air rejection to be defined.

Relocation time	Total	
3 days / Fire central	3 days	Service interruption, No fire detection in Point 7
4 days preparation/ Fire detector + 2 days for connecting new detectors to the central	12 day + 3 days	Service interruption, No fire detection in detectors area
?? days / Gaz central	?? days	Service interruption, No gas detection in Point 7



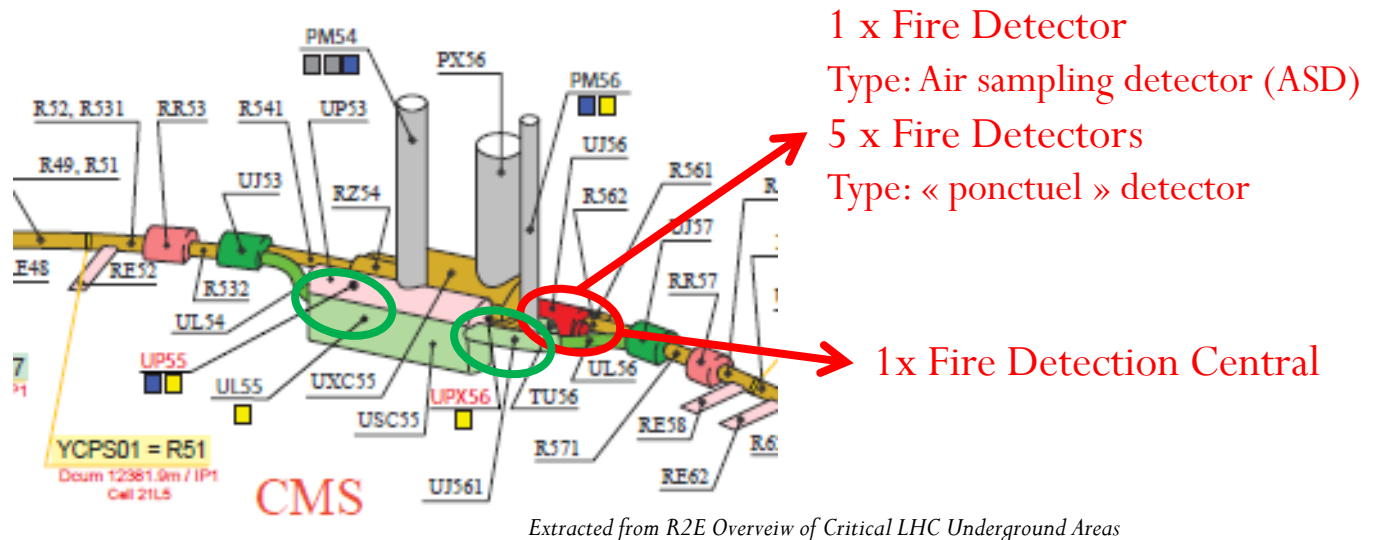
Equipment Inventory

Point 5- Critical R2E areas

Detection Equipment	Location	Criticality
Fire Detection Central Fire Detectors	UJ56 UJ56 RE52, RE58 <i>RR53, RR57</i> UL55-UJ561	Relocation to USC55 Relocation SAFE SAFE SAFE
ODH Detection Central ODH Detectors	USC55 R51-RE52-R52 R58-RE58-R59 RR53-UJ53- RZ54-UPS54 RR57-UJ57-UJ56-UPS56 USC55 UXC55 UL55-UGX55 (local gaz)	SAFE SAFE SAFE SAFE SAFE SAFE SAFE SAFE

Relocation Constraints

Point 5 - Critical R2E areas



- Central: Under verification space available in USC55 ? (S2A19)
- Detectors: Standard air sampling detection.
 - Need of 4m wall for the ASD detectors installation, at < 150 m (UJ561 ?) from UJ56.
 - ASD detectors installed instead of “ponctuel” detectors (contain electronics inside)

Relocation time	Total
3 days / Fire central	3 days
4 days preparation/ Fire detector + 2 days for connecting new detectors to the central	12 ?? days + 2 days

Service interruption,
No fire detection in tunnel areas

Service interruption, No fire
detection in detectors area



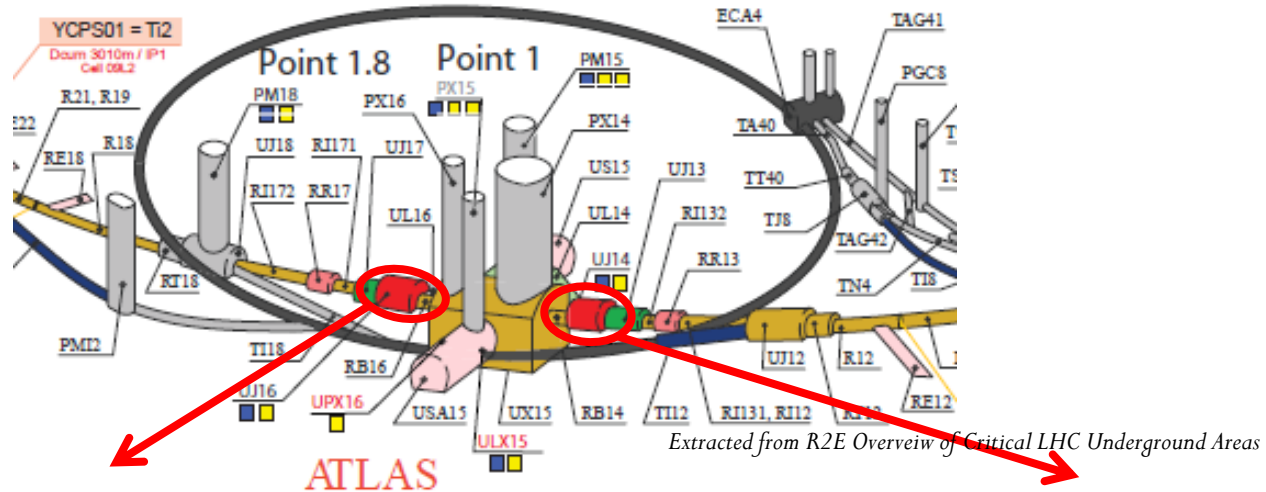
Equipment Inventory

Point 1- Underground

Detection Equipment	Location	Criticality
Fire Detection Central	US15	SAFE
Fire Detectors	US15	SAFE
(ASD, « ponctuel »)	UX15 (side US15)	SAFE
	RE12, RE18	SAFE
	RR13, RR17	SAFE
	UJ14, UJ16	Relocation
ODH Detection Central	US15	SAFE
ODH Detectors	US15	SAFE
(« ponctuel »)	UL14-UJ14-RR13	SAFE
	UL16-UJ16-RR17	SAFE
	R11-RE12-R12-UJ12	SAFE
	R19-RE18-R18-UJ18	SAFE

Relocation Constraints

Point 1 - Critical R2E areas



4 x Fire Detector
Type: Air sampling detector (ASD)

4 x Fire Detector
Type: Air sampling detector (ASD)

• Detectors: Standard air sampling detection.

- Need of 6m wall for ASD detectors installation, at < 150 m (UL14 or UL16 ?) from UJ14/16.

Relocation time	Total
4 days preparation/ Fire detector + 2 days for connecting new detectors to the central	14 days + days

Service interruption, No fire detection in detectors area



Failure Consequences

Equipment Type	Impact	Test/Incident	Criticality
Fire Detection Central	All detectors of the central Personnel and Equipment Protection Required for ACCESS and RUN mode	Fire central in TCV4 died after several hours of CNGS beam	VERY HIGH
Gas Detection Central	All detectors of the central Personnel Protection Required for ACCESS mode		VERY HIGH
Fire Detector ASD type	Detector or chain of detectors Personnel and Equipment Protection Required for ACCESS and RUN mode	CNGSTest Many faults requiring a hardware reset to go back to normal functioning	HIGH
Gas Detector « ponctuel » type	Detector or chain of detectors Personnel Protection Required for ACCESS mode	TCC2 Radiation Test Design modification: Deported electronics	LOW



Failure Consequences

CNGS Centrale de test SFDIN 2000											
Test de fonctionnement											
Date	Heure	Groupe	Détecteur	Al.fumée	Dérangement	Type d'ASD	MDI	SLI 51	SLM 35	Reset soft	Reset hard
27/04/2010	11:37	0001	02	X		516	X			OK	
27/04/2010	11:37	0002	01	X		535	X				
27/04/2010	11:37	0003	01	X		516		X			
27/04/2010	11:37	0003	02	X		516		X			
27/04/2010	11:37	0004	01	X		535			X		
27/04/2010	11:37	0004	02	X		535			X		
27/04/2010	11:40	0001	01	X		516	X				
27/04/2010	11:41	0002	01	X		535	X				
CNGS Centrale de test SFDIN 2000											
Date	Heure	Groupe	Détecteur	Al.fumée	Dérangement	Type d'ASD	MDI	SLI 51	SLM 35	Reset soft	Reset hard
02.05.2010	1:53	0003	01		X	516		X		N OK	OK
02.05.2010	1:53	0003	02		X	516		X			
02.05.2010	3:30	0002	01		X	535	X				
02.05.2010	12:26	0004	01		X	535			X		
04.05.2010	5:53	0001	01		X	516	X			N OK	OK
04.05.2010	5:53	0001	02		X	516	X				
04.05.2010	9:03	0001	02		X	516	X				
04.05.2010	9:11	0002	01		X	535	X				
08.05.2010	10:21	0001	01		X	516	X				
08.05.2010	10:21	0001	02		X	516	X				
09.05.2010	19:27	0002	01		X	535	X				
10.05.2010	9:12	0001	01		X	516	X			N OK	OK
10.05.2010	9:12	0001	02		X	516	X				
10.05.2010	9:12	0002	01		X	535	X				

Correct Functioning
Technical Stop (end April)



Correct Functioning
Technical Stop (end May)





Costs & Planning

Equipment	Relocation item	Unit cost estimate	Total Cost	Planning Proposal
UJ76	UJ76 fire central			Xmas Shutdwon
	RR73/77 detectors			Long Shutdown
UJ56	UJ56 fire central			Xmas Shutdwon
	UJ56 detectors			Long Shutdown
	UJ56 gaz central			Xmas Shutdwon
UJ14	UJ14 fire detectors			Long Shutdown
UJ16	UJ16 fire detectors			Long Shutdown



Additional comments on PS

- Radiation is already a critical issue for PS Fire Detection:
 - 2 fire detectors in fault (in ventilation station n-2), covering $\frac{1}{4}$ of the PS
 - The same sensors were changed 3 weeks before this fault
 - Temporally relocation undergoing (1.6.2010), displacement towards door 151
 - Current detectors very expensive and old
- Urgent need for relocation of PS fire detectors
 - Install them near the center of the ring
 - Replace current detectors by ASD detectors (non-standard configuration)
- Cost estimate:
- Relocation time: **3 weeks** of preparation + **3 days** of interruption